Reasonably Available Control Technology Analysis

January 19, 2017

Air Pollution Control Division

Colorado Department of Public Health & Environment

COLORADO
Department of Public Health & Environment

RACT – Basics

- Moderate Ozone NAAs are required to implement RACT
- RACT level controls required for:
  - All VOC sources subject to a CTG
  - All major VOC and NOx sources
- RACT – "lowest emission limitation that a particular source is capable of meeting by the application of control technology that is reasonably available considering technological and economic feasibility"
- RACT analysis must reflect the "latest information"

RACT Analysis Request

- Regulation 7 – Section XIX.B Major Sources
  - 16 Sources
  - Must submit a RACT analysis by December 31, 2017

	Source	Source ID	Unit Type	Emissions Points
1	Anheuser-Busch	069-0060	Brewing	all points ≥ 2 tpy VOC and ≥ 5 tpy NOx
2	Buckley Air Force	005-0028	Engines/test cell	102, 103, 104, 105, 101
3	Carestream Health	123-6250	Boiler	004
4	Colorado State University	069-0011	Boilers	003, 005, 007, 013
5	IBM	013-0006	Engines & boilers	088, 090, 001, 011, 095
6	MillerCoors Golden Brewery	059-0006	Brewing	all points ≥ 2 tpy VOC and ≥ 5 tpy NOx
7	MMI/EtOH	059-0828	Brewing waste	all points ≥ 2 tpy VOC and ≥ 5 tpy NOx
8	Nutri-Turf	123-0497	Brewing waste	all points ≥ 2 tpy VOC and ≥ 5 tpy NOx
9	Owens-Brockway Glass	123-4406	Glass melt furnaces	all points ≥ 5 tpy NOx (001-023, 025)
10	Public Service Company - Cherokee	001-0001	Turbines	028, 029
11	Public Service Company - Fort Saint Vrain	123-0023	Turbines & Boilers	010, 011, 001
12	Rocky Mountain Bottle	059-0008	Glass melt furnaces	001
13	Suncor	001-0003	Boilers	309, 019, 021, 023
14	Tri-State G & T - Frank Knutson	001-1349	Turbines	001, 003
15	TXI	059-0409	Shale Kiln	001
16	University of Colorado - Power House & East	013-0553	Boilers	001, 002, 012, 013
	University of Colorado - Williams Village	013-0019	Boliers	001, 002

Sooner if Possible

RACT Analysis Request

- Other Major Sources
  - 9 Sources
  - Must submit a RACT analysis by December 31, 2017

Sooner if Possible

	Source	Source ID	Unit Type	Emissions Points
1	Colorado Energy Nations Company	059-0820	Boilers	001, 002
2	Colorado Interstate Gas - Latigo Compressor Station	005-0055	Engines	001, 011
3	Colorado Interstate Gas - Watkins Compressor Station	001-0036	Engines	001, 002, 005
4	Public Service Company - Denver Steam	031-0041	Boilers	001, 002
5	Public Service Company - Fort Lupton	123-0014	Turbines	001, 002
6	Public Service Company - Valmont	031-0001	Turbine	002
7	Public Service Company - Zuni	031-0007	Boilers	001, 002, 003
8	Kerr-McGee Gathering - Platte Valley Gas Plant	123-0057	Turbine & Engines	052, 038 - 041, 044, 047-049
9	WGR Wattenberg Gas Processing Plant	001-0025	Boiler, Turbine & Engines	012, 021, 004, 018

Considerations

- Differences in RACT – SIP vs. permit
  - categorical vs. source specific
  - existing vs. new/modified
- Reasonably available, technologically and economically feasible
- RACT may range from nothing more to work practices to add-on controls
- 2008 vs. 2015 O3 standard

RACT Analysis - General

- Emission Point Specific
- Pollutant Specific
  - NOx, VOC
- RACT analysis needs to consider all typical control technologies for the emission unit or point
  - Control Technology – can mean a control device or work practice
  - Top-down ranking by most effective at emission reductions (tons/year)
  - Annualized (based on equipment life) costs per ton of pollutant reduced
  - Can use EPA Air Pollution Control Cost Manual
    - https://www.epa.gov/economic-and-cost-analysis-air-pollution-regulations/cost-reports-and-guidance-air-pollution#cost
  - Other Resources
    - RACT/BACT/LAER Clearinghouse
    - Ozone Transport Region

RACT Analysis - Content

- Description of Emissions Unit or Point
  - Manufacturer and unit power rating on primary fuel
  - Date unit placed into service
  - Type of control technology (or could include work practice) already in use for applicable pollutants
  - Date of installation or implementation of current control technology
  - Estimate of current control technology effectiveness
    - Capture
    - Control Efficiency

RACT Analysis - Content (continued)

- Top-down evaluation of all potential emission control technologies available
  - List each available (prevalent) control technology for each applicable pollutant
  - Describe the control technology
  - Discussion of technological feasibility of each control technology
  - Evaluate control effectiveness of each technically feasible control technology
  - Determine actual emissions reduction for each technically feasible control technology

RACT Analysis - Content (continued)

- Determination of Control Technology Cost (includes work practice)
  - Capital cost of each control technology evaluated
    - Cost of device or equipment and materials
    - Vendor bid documentation is preferred
  - One-time costs
    - Delivery, engineering, labor, equipment and incidental costs
    - Installation and startup costs
  - Annual operation and maintenance costs
    - Maintenance, equipment replacement (e.g. catalyst), monitoring
  - Indirect and Other costs
    - Overhead, administration, taxes, insurance, contingency
  - Description and estimate of potential cost savings
  - Calculate total annualized cost of control technology
    - Determine $/ton cost for each control or work practice
- Provide RACT recommendation for the unit based on technological and economic feasibility
  - Include proposed monitoring methods or options

RACT Analysis - Content (continued)

- Cost Amortization Considerations
  - Standard assumption for interest rate
    - 2014 O&G rulemaking used 5-6% interest rate
  - Standard assumption for useful life of equipment
    - Depends on equipment or work practice
    - 2014 O&G rulemaking used 5-15 years depending on equipment or work practice
  - Other cost assumptions
    - Can use EPA Cost Manual
- Potential example templates for RACT analysis
  - https://www.colorado.gov/pacific/cdphe/regional-haze-plan
- Division working on very basic guidelines/expectations for RACT analysis

Example Engine RACT Cost Calculations

VOC Analysis for Spark-Ignited 4-Stroke Lean Burn RICE

Source Information		
Manufacturer:	***Caterpillar***	
Model:	***G3412CLE***	
Classification:	**SI-4S-LB**	
Rating (horsepower):	***586***	
Assumptions		
Useful Life-Control Equipment (years):	10	
Catalyst Replacement (years):	5	
Annual Interest Rate (%)	5%	
Emissions		
VOC Emissions:	**2.285**	
Oxidation Catalyst Control Efficiency:	**50%**	
Annual VOC Emissions Reduced (post control in tons/year):	**1.142**	
Costs		
Capital (Direct)		
Oxidation Catalyst:	$	8,330
Material:	$	2,848
Structural Support:	$	7,125
Annualized Capital Costs:	***$***	***2,981***
Construction		
Labor:	$	10,454
Equipment:	$	3,833
Incidental & Miscellaneous (assume 10% Engr/Comm/Labor/Equip):	$	1,429
Delivery (5% of Capital & Construction Cost):	$	1,630
Annualized Construction Costs:	***$***	***2,825***

Annual		
Maintenance & Monitoring ($/yr):	$	4,000
Annualized Costs:	***$***	***4,000***
Replacement (Annualized)		
Catalyst (every 5-years):	$	2,126
Install/Construction (10% of Original):	$	2,732
Annualized Replacement Costs:	***$***	***1,240***
Other		
Taxes (assume 8% of Capital):	$	239
Contingency (assume 10% of Capital & Construction):	$	581
Annualized Replacement Costs:	***$***	***819***
Indirect		
Overhead (60% of all labor plus maintenance materials-EPA Cost Manual):	$	8,672
Adminstration (2% of total capital investment-EPA Cost Manual):	$	366
Property Taxes (1% of total capital investment-EPA Cost Manual):	$	183
Insurance (1% of total capital investment-EPA Cost Manual):	$	183
Annualized Indirect Costs:	***$***	***1,532***
Capital Cost Recovery		
NPV (net present value):		$9,861.94
CRF (capital recovery factor):		0.2309748
Capital Recovery = [NPV * CRF]; see EPA Cost Manual-EQ. 2.8:		$2,277.86
Annualized Capital Recovery Costs:	***$***	***2,278***
Total of Annualized Costs:	**$**	**15,676**
Cost Effectiveness		
VOC control cost(Total Annualized Costs/Annual VOC Emissions Reduced):	**$**	**13,723**

Questions

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